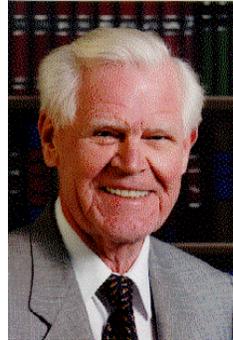


PHR 250

Foodborne Infections and Intoxications

Course Leader:
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Hans P. Riemann, 1920 – 2007



CLASSIFICATION OF FOODBORNE PATHOGENS; SOURCES OF CONTAMINATION

Dean O. Cliver

Outline

1. Taxonomic classification
2. Classification by mode of pathogenesis
3. Overview of how pathogens enter foods

Taxonomic classification of foodborne pathogens

- ◆ Prions
- ◆ Viruses
- ◆ Bacteria
- ◆ Fungi
- ◆ Protozoa
- ◆ (Algae, cyanobacteria)
- ◆ Metazoan parasites
- ◆ Toxic plants and animals

Infectious agents

Properties of foodborne infections:

- ◆ Agent must be present in food in viable (infectious) form at the time of ingestion
- ◆ Agent multiplies to cause illness (incubation period)

Infectious agents

- ◆ Prions—new variant CJD
- ◆ Viruses—hepatitis A, noroviruses, etc.
- ◆ Bacteria—*Campylobacter*, *Clostridium perfringens*, *Escherichia coli*, *Listeria*, *Salmonella*, *Shigella*, *Vibrio*, etc.

Infectious agents

- ◆ Protozoa—*Cryptosporidium parvum*, *Entamoeba histolytica*, *Giardia lamblia*, *Toxoplasma gondii*, etc.
- ◆ Metazoan parasites—roundworms, tapeworms, flukes

Intoxicating agents

Properties of foodborne intoxications:

- ◆ Toxic substance is present in food at the time of ingestion
- ◆ Onset of illness is often more rapid

Intoxicating agents

- ◆ Bacteria—*Bacillus cereus*, *Clostridium botulinum*, *Staphylococcus aureus*
- ◆ (Algae, cyanobacteria)

Intoxicating agents

- ◆ Fungi—*Aspergillus*, *Fusarium*, *Penicillium*, etc.
- ◆ Toxic plants and animals—mushrooms, cassava, fugu, etc.
- ◆ Chemicals

Other classes of foodborne disease

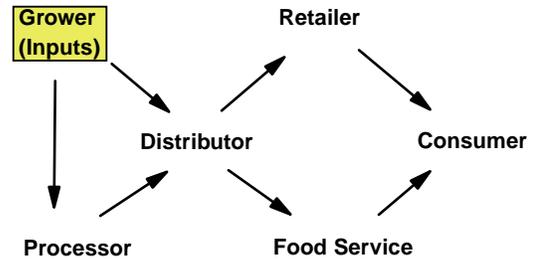
- "Exceptional" foodborne diseases:
- ◆ Allergy—serologic reaction
 - ◆ Intolerance—enzyme deficiency (abnormal people?)

Other classes of foodborne disease

Idiopathic illnesses:

- ◆ Acute—"Chinese restaurant syndrome"
- ◆ Chronic—cancer, heart disease

"Food Chain"



Sources of foodborne pathogens

Preharvest:

- ◆ Inherent toxicants—acorns, cassava, olives, etc.

Sources of foodborne pathogens

Preharvest:

- ◆ Zoonoses—enterohemorrhagic *E. coli*, *Trichinella spiralis*, (*Brucella*, *Coxiella burnetii*, *Mycobacterium bovis*, prions of BSE), etc.

Sources of foodborne pathogens

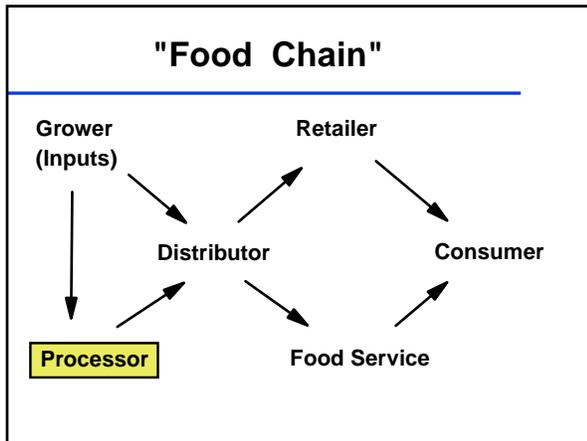
Preharvest:

- ◆ Field contaminants—*Cryptosporidium parvum*, enterohemorrhagic *E. coli*, *Vibrio parahaemolyticus*, etc.

Sources of foodborne pathogens

Harvest or slaughter:

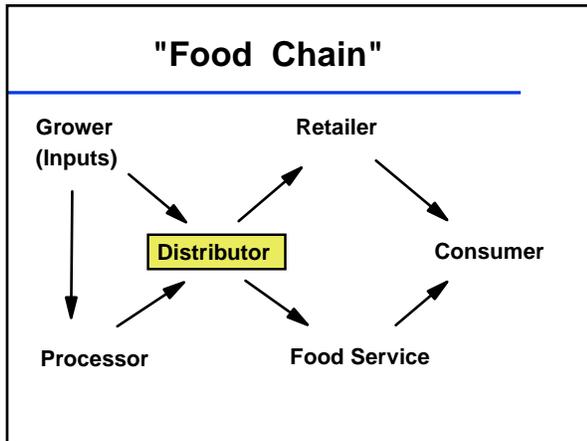
- ◆ Cross-contamination—*Listeria*, *Salmonella*
- ◆ Water—enterohemorrhagic *E. coli*, hepatitis A virus, etc.
- ◆ Humans—hepatitis A virus, *Salmonella*, etc.?



Sources of foodborne pathogens

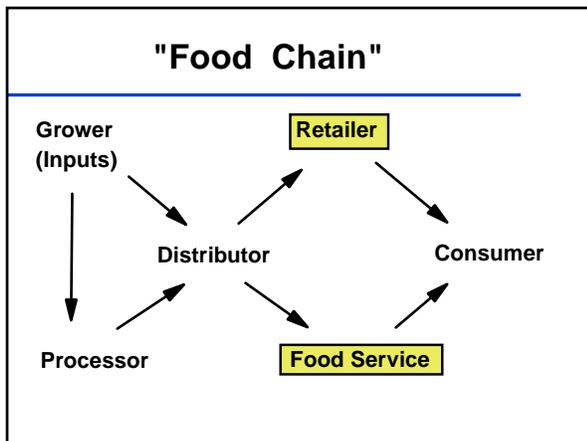
Processing:

- ◆ Problems rare in U.S. at present
- ◆ Colonization of facilities by *Listeria*, *Salmonella*
- ◆ If bakeries are included, viruses



Sources of foodborne pathogens

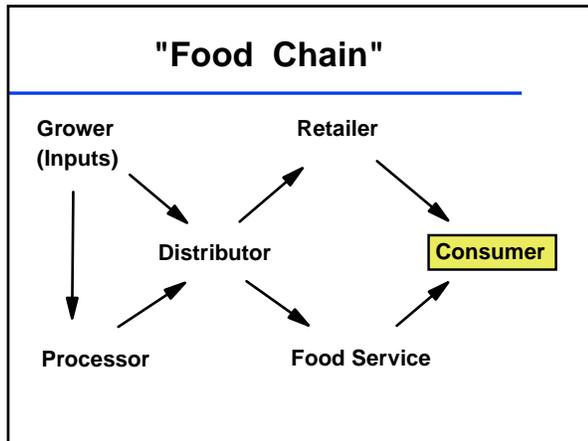
- ◆ Storage and distribution—most problems with temperature control, rather than contamination



Sources of foodborne pathogens

Retailing and food service;

- ◆ Opportunities for human-source contamination: hepatitis A virus, *Shigella*, pathogenic *E. coli* (other than EHEC)
- ◆ Cross-contamination with EHEC, *Listeria*, *Salmonella*, etc.



Sources of foodborne pathogens

Final preparation and serving

- ◆ Opportunities for human-source contamination:
 - bacteria & viruses
 - *Giardia lamblia*
 - *Taenia solium*
 - etc.

Summary

- ◆ Foodborne pathogens can be classified
 - taxonomically or
 - by mode of pathogenesis
- ◆ Pathogens may enter food at any stage; some risks are more easily remedied than others